

FluxRite Inflow Control Device

APPLICATIONS

- Sandface completions requiring flow control
- Horizontal wells requiring toe-to-heel pressure profile control
- Vertical wells with commingled zones of different pressures
- Thermal wells requiring steam-injection optimization

ADVANTAGES

- Reduces or eliminates toe-to-heel sweep inefficiency
- Reduces or eliminates water/gas coning
- Creates more drawdown at toe to remove mud damage
- Chokes off water/gas/steam to and from high-permeability streaks
- Achieves higher oil rates and longer well life
- Resists erosion and corrosion and is very robust
- Can be delivered and installed quickly and easily

FEATURES

- Nozzle-based system is insensitive to viscosity.
- Adjustable nozzles at wellsite enable production optimization after actual reservoir information is acquired.
- ICD system is typically combined with MeshRite* medium.
- System combines easily with swell or hydraulic packers to minimize annular flow.
- System meets erosion and corrosion requirements with a wide selection of metals.
- Excellent technical support and modeling ensures optimum design.

FluxRite™ ICD systems combine the MeshRite sand control medium with a flow-choking device to provide a linear production or injection profile throughout the length of the wellbore.

These ICD systems thus provide optimum production or injection while sweeping reservoir reserves much more effectively. FluxRite systems use nozzles that are different from channels and tubes in three ways. First, the pressure drop is independent of fluid viscosity, ensuring that viscous oil is not selectively choked off. Second, pressure drop varies with velocity squared, enabling a greater choking capacity for unwanted water and gas influx from high-permeability streaks. Third, the ICD strength can be quickly and easily adjusted at the wellsite simply by interchanging the nozzles.

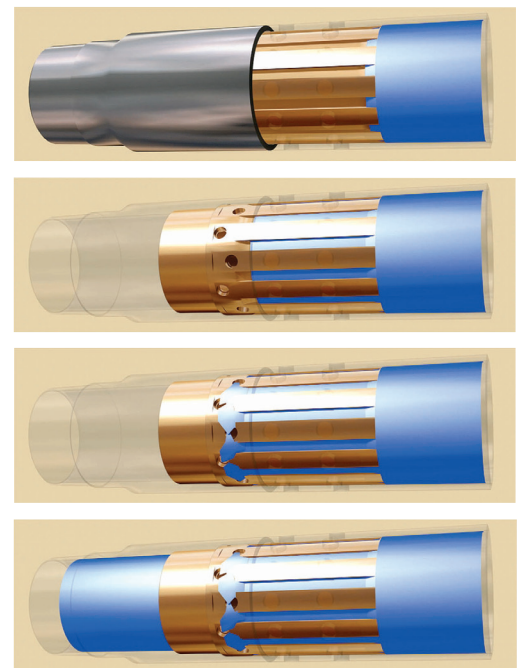
Without flow control, production from horizontal wells is never uniform from toe to heel. The result is lower oil production and recovery because of

- higher drawdown at the heel
- high-permeability streaks that allow a high influx of water and gas
- limited cleanup of the mud damage from the toe section.

Field experience overwhelmingly indicates that pressure profile control is required on almost all horizontal wells to

- eliminate the toe-to-heel effect in homogeneous reservoirs
- choke off unwanted gas and water in heterogeneous reservoirs
- create adequate drawdown at the toe to remove mud damage.

With the FluxRite system, the ICD strength can be adjusted at the wellsite. The industry-proven MeshRite medium is the optimum sand control screen.



FluxRite ICD flow path.

For production, fluids flow radially from the reservoir through the filter medium surrounding the basepipe, under the medium, and along the outside of the basepipe to the ICD nozzle section. There the fluids enter the basepipe. For injection, the flow path is reversed, but the design is optimized to prevent erosion directly downstream of the nozzles.

FluxRite screens are available in lengths customized for each application. Typical configurations are 30 ft [9.1 m] of filtration medium on 38 ft [11.6 m] of basepipe and 20 ft [6.1 m] of filtration medium on 25 ft [7.6 m] of basepipe.

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CUSTOMIZED SOLUTIONS

FluxRite screens provide several options that can be configured for specific well applications. When a full-length sand control screen is not required (as in consolidated reservoirs or carbonates), a simple, economical ICD sub is available with a short filtration section to prevent random solids from entering the tubing.

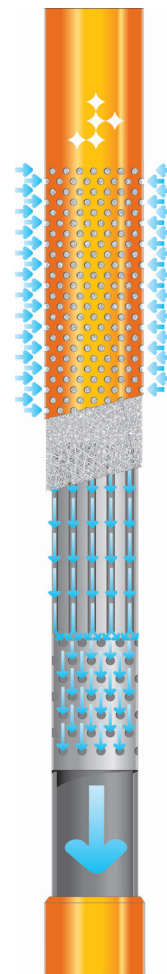
Designs are available for steam injection, steam-assisted gravity drainage (SAGD), and cyclic steam stimulation (CSS) projects. Improved placement of steam injection decreases the steam/oil ratio, which results in lower costs and improved recovery. ICDs can be placed on each joint or spaced out over several joints to optimize both flow control and completion costs.

ICD MODELING

The key to a successful ICD installation is fast, accurate reservoir modeling. Specific applications of the FluxRite system are supported by two state-of-the-art computer models:

- a quick, accurate nodal analysis program that provides a snapshot of the effect of a specific ICD design on production and injection
- a multisegment, fully 3D reservoir model that allows investigation of the effect of the ICD on production over time.

The nodal analysis program provides for direct import of directional surveys, log data, and ECLIPSE* reservoir simulation software output files (*.EGRID, *.INIT, *.UNRST) for quick, accurate ICD design. Extensive laboratory tests have been performed on full-scale FluxRite joints to prove mechanical integrity and theoretical modeling accuracy. Field studies have been conducted to prove the benefits of ICDs and the FluxRite system.



FluxRite screen.

Specifications

Tubing sizes, in	2 $\frac{3}{8}$ –7
Typical joint lengths, ft [m]	38 [11.6] or 25 [7.6]
Net screen length, ft [m]	30 [9.1] or 20 [6.1]
Screen medium [†]	MeshRite screen (434SS and 316L compressed fiber)
Pore size, μ m	15–650
Screen flow area	Variable
Nozzle construction	Tungsten carbide
Nozzle sizing	Variable depending on well and reservoir requirements
Max. bend radius, °/ft	45/100

Example assembly for 5½-in, 17-lbf/ft screen

ID, in [mm]	4.95 [126]
OD, in [mm]	6.25 [159]
Collapse strength, [‡] psi [MPa]	5,604 [38.7]
Burst strength, [‡] psi [MPa]	7,060 [48.7]
Tensile strength, [‡] lbf [N]	284,000 [1,264,000]
Torque resistance, [‡] lbf.ft [N.m]	33,700 [45,700]

[†] Premium sintered mesh screen medium is available on request.

[‡] The values of all mechanical properties are based on 80,000-psi material and contain an engineering safety factor.

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